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GLACIAL POT-HOLES AT CROWN POINT, NEW YORK

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Glacial pot-holes have been described from various parts of the glaciated regions of North America and Europe. They occur singly or in groups, in positions unrelated to the beds of modern streams. Perhaps the best-known examples are in the famous Glacier Garden at Lucerne in Switzerland, where they are seen by many tourists every year. Even more remarkable than this most advertised occurrence is a small area on the Dalles of the St. Croix River near Taylor's Falls, Minn., described in detail by Upham (31). He says it is "unsurpassed by any other known locality in respect to the variety of forms and grouping, their great number and extraordinary irregularity of contour." In all, there occur within the area not fewer than 100, large and small.

The purpose of this note is to call attention to and describe a very fine specimen of glacial pot-hole that has been discovered recently at a place of commanding historic interest—Crown Point on Lake Champlain, a long promontory of horizontally bedded limestone jutting northward into the lake. Because of its great strategic importance this point was fortified by the French in 1731. Fort St. Frédéric, the stronghold they built, was captured and destroyed by the British under General Amherst in 1759. Immediately afterward, Amherst built the great star-shaped fortress with ramparts extending half a mile in circumference, whose ruins now attract thousands of visitors annually. In the summer of 1912, while these ruins were being explored and reinforced by the state government, the pot-hole here described was discovered.

Fig. 1 shows the pot-hole with the ruins of the soldiers' barracks and a portion of the ramparts in the background. It extends to a depth of 14 feet 7 inches into the topmost strata of the Chazy limestone formation. The aperture at the surface is an irregular oblong measuring 6 feet 4 inches by 9 feet 7 inches. The longer

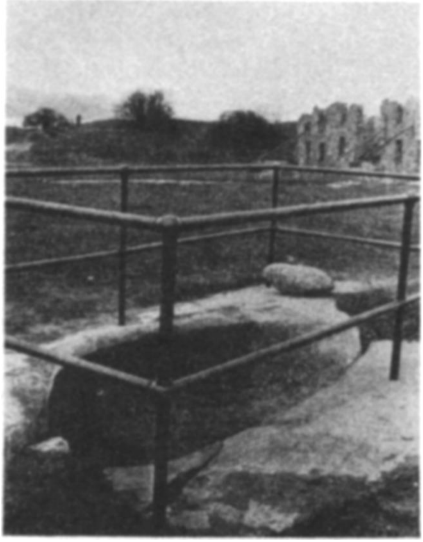

FIG. 1.—Glacial pot-hole at Fort Crown Point. Ruins of soldiers' barracks, with a bit of the encircling ramparts, and a glimpse of Lake Champlain in the background. (Copyright 1913 by E. E. Barker.)

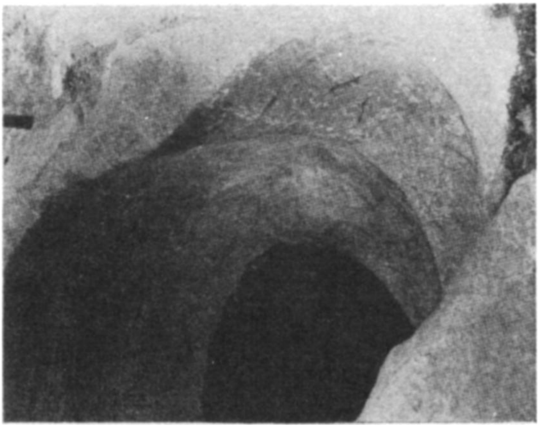

FIG. 2.—Glacial pot-hole, at Fort Crown Point. Looking in from above

axis coincides with a joint-plane. The pot-hole shows four stages of grinding, each deeper than the preceding, excentric to it, and somewhat larger in diameter (Fig. 2). The first and shallowest is farthest to the north. This might indicate that during the first stages of its formation the ice mass was moving southward. Its greatest diameter is 7 feet 4 inches, and is found just below the second shoulder. Beyond this the deep cylindric bore is attained. The inside surface is very smooth in places, but in part is marked with a low relief of ridges due to differential erosion of the harder and softer portions of the rock (Fig. 3). The pot-hole, when discovered, was filled with its original content of glacial débris intact. Many wagon loads of this material, consisting of large bowlders smoothly rounded, smaller cobblestones, with a filling of gravel and sand, were removed and piled in a cairn near by. They are mostly crystalline rocks, and are of great variety, representing nearly all of the formations found in the region to the north. The large bowlder that lay in the apex of the hole, together with two beautifully rounded smaller ones that lay on either side of it, has been preserved. The largest is shown just inside the railing in Figs. 1 and 3. These stones were evidently the active tools of the glacial torrent at the time when grinding ceased and the hole became clogged with the mass of débris with which it was filled. The surface of the surrounding rock is planed smooth and is scored with glacial striae.

Another glacial pot-hole occurs on Towner Hill, about six miles west from Lake Champlain, and about eight or ten miles southwest from the locality described above. This pot-hole was filled with ice when the photograph was taken, but it is said to be 8 or 10 feet deep (Fig. 4). At the surface of the ice its diameter measured 5 feet by 4 feet 4 inches. Its original depth must have been considerably greater, because it has suffered erosion since its formation that has truncated it obliquely to its perpendicular axis. The rear wall rises 5 feet 6 inches above the surface of the ice that filled it to the lowest portion of the rim at the time it was seen (Fig. 4). It is located half-way down the face of a cliff of hard gneiss at an altitude of about 1,260 feet according to the U.S. Geological Survey sheet (Paradox Lake Quadrangle, N.Y.). The

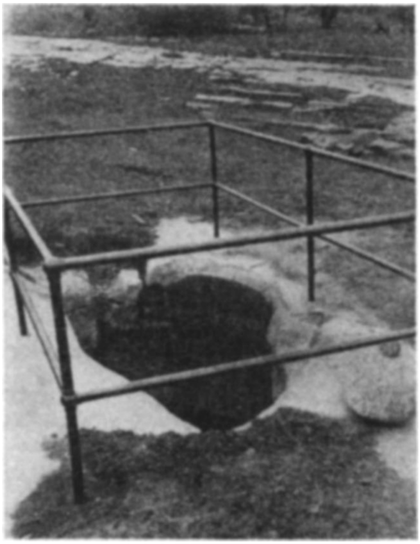

FIG. 3.—Glacial pot-hole at Fort Crown Point, showing irregular aperture, ridged inner surface, and the principal grinding-stone.

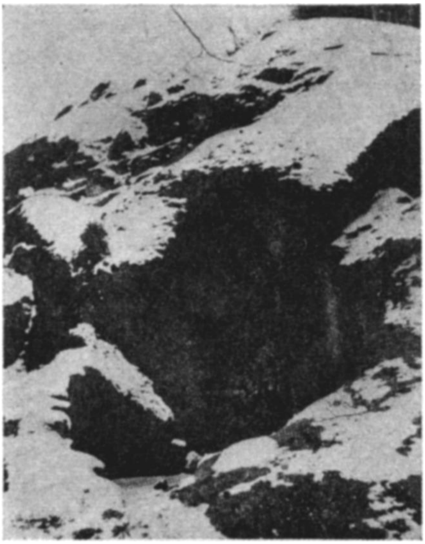

FIG. 4.—Glacial pot-hole on Towner Hill, Crown Point, N.Y.

rim is smoothed and rounded off, and it has unmistakably undergone great erosion and weathering since it was bored.

At the foot of the cliff is the remnant of a still larger pot-hole that now forms a shallow niche in the face of the cliff, and comprises the arcs of two intersecting circles with a combined diameter of 12 to 15 feet for the original pot-hole. The diameter of the smaller arc is computed to be 6.12 feet. Its depth is unknown, as it has never been cleared of the débris that fills it.

Upham (31) describes a pot-hole in the Interstate Park at Taylor's Falls in every way similar to this latter one. He suggests the hypothesis that it was formed partly in rock and partly in ice, and that when the ice melted away it was left in the imperfect form seen at present. The pot-hole described here, however, because of its proximity to another that shows unmistakable evidence of erosion, would seem to favor the hypothesis that it was bored in solid rock, and that, subsequently, the greater portion of it had been eroded away. Both pot-holes occur nearly at the top of a mountain, and are far from any stream bed. Their partial demolition after their formation supports Upham's hypothesis that such pot-holes were formed during the early stages of the ice-sheet; but they can be equally well explained by the advance of a later ice invasion.

March 17, 1913.

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